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ROYAL GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

Nos. 58–59.] OCTOBER and NOVEMBER. [1891.

CCXVIII.—CHINESE FIBRES.

Under the name of jute or hemp there are included a number of commercial fibres in China yielded by very different plants. There are different fibres bearing the same name, and the same product often bears different names at different ports. The fault is probably due to the fact that European traders have used the terms jute and hemp in a generic sense rather than a specific one. There is probably also a fiscal element concerned, as the duty on "jute" is only "2 mace per picul," whereas "hemps" pay 3½ mace. An inquiry made by Kew less than a year ago in regard to the origin of Chinese jute, as quoted in the London trade lists, has brought out very forcibly the confusion which exists in regard to the origin and classification of commercial fibres at Chinese ports.

It has been shown that Chinese jute, identical in all respects with, Indian jute, and yielded by the same plant, *Corchorus capsularis*, L., is grown and prepared in the neighbourhood of the town of Wênchow while the so-called jute of Northern China is obtained from an entirely

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different plant which has been lately identified, from specimens forwarded to Kew by the Acting Consul at Chefoo, Mr. Alexander Hosie, as *Abutilon Avicennæ*, Gærtn. In regard to the application of the term hemp this appears to be still more widely and loosely used. It is applied, in its usual sense, to the common or Russian hemp, grown in Northern China, the produce of *Cannabis sativa*, L. It is also indifferently used and applied to the China grass or Rhea fibre (*Boehmeria nivea*, Hk.) of Kiukiang, to the fibre prepared from the bark of young trees of *Sterculia platanifolia*, L., at Hupeh, and to the pine-apple fibre (*Ananas sativus*, Baker) of Kiungchow, Hainan, and Formosa.

The application of such well-established terms as jute and hemp to fibres so different in character and origin must lead to much confusion and tend to retard the development of trade. One of the most interesting of Chinese fibres is that derived from the Ko plant, a trailing vine identical with *Pueraria thunbergiana*, Benth. This fibre, known locally as Ko-pou, has also passed under the name of hemp, although the quantity produced is apparently very small. An account of this Ko plant is given in the *Enumeration of Chinese Plants*, Journ. Linn. Soc., vol. xxii., p. 191.

To return to the subject of jute. Seeds and specimens of Chinese jute from South Manchuria received at Kew in 1879 through Mr. Arthur Davenport, Her Majesty's Consul at Shanghai, proved to belong to *Abutilon Avicennæ*, Gærtn. Fibre yielded by the same plant was forwarded to Kew in 1885 by Mr. W. M. Cooper, Her Majesty's Consul at Ningpo. The very complete set of botanical specimens, with fruits and seeds, recently received through the Foreign Office from Mr. Alexander Hosie, Acting Consul at Chefoo, has already been noticed. These specimens, with the full report furnished by Mr. Hosie, afford very conclusive information respecting the origin of the so-called jute of Northern China. This may now be more correctly called Abutilon Hemp. Another set of specimens, illustrative of the pine-apple fibre (also called hemp) has been received from Mr. E. H. Parker, Her Majesty's Consul at Kiungchow in Southern China.

The detailed information, so far obtained respecting the distribution and origin of Chinese jutes and hemps, is given in the following correspondence. It is desirable to place this information on record as a basis for the further inquiry which is in course of being undertaken at Chinese ports under the direction of Sir Robert Hart, G.C.M.G., Inspector-General of the Chinese Imperial Maritime Customs. The very interesting memorandum prepared by Dr. Henry, F.L.S., is of special value for the purpose of aiding in such an inquiry, and this establishment is greatly indebted to Sir Robert Hart for the copy of it communicated in the form of a pamphlet—China, Imperial Maritime Customs, II.:—Special Series: No. 16, 1891.

Inspectorate General of Customs, Peking,
December 27, 1890.

An inquiry respecting "Chinese jute" having been made by the Director of the Royal Gardens at Kew, Dr. Augustine Henry, one of the Service Medical Assistants now on leave, who has paid considerable attention to botanical subjects, prepared a memorandum on the jute and hemp of China, setting forth the present extent of our knowledge, and formulating certain points for elucidation. The original inquiry and the subsequent memorandum are hereto appended, and the ports

concerned are requested to keep the matter in view and, while supplying the Inspector-General with such reports as may be drawn up, forward to the Non-Resident Secretary for the Kew Gardens such specimens as can be procured.

By order,
(Signed) E. B. Drew,
Chief Secretary.

Royal Gardens, Kew, to the Non-Resident Secretary.

Sir, Royal Gardens, Kew, October 9, 1890.

I am desired by Mr. Thiselton Dyer to inform you that a sample of "China jute," a small portion of which is enclosed herewith, has lately been presented to the Museum of Economic Botany at Kew. This "jute," we take it, is prepared and shipped from some part of China, but we are unable to trace its origin.

2. This establishment takes a special interest in the industrial application of plant products, and we have received very valuable aid from time to time from officers connected with the Department of the Chinese Imperial Maritime Customs, for which we are very grateful.

3. In the present instance, Mr. Thiselton Dyer would esteem it a great favour if Sir Robert Hart could assist him in obtaining dried botanical specimens of the plant which yields "China jute," together with some particulars respecting the methods pursued in preparing it for market. The botanical specimens should, if possible, consist of leaves, flowers, and fruit, placed between sheets of paper and strengthened by cardboard. In this manner they would travel very well by parcel or book post.

I am, &c.
(Signed) D. Morris,
Assistant Director.

J. D. Campbell, Esquire, Secretary, Chinese Imperial Maritime Customs, 8, Storey's Gate, St. James's Park, S.W.

Memorandum on the Jute and Hemp of China, by Dr. Augustine Henry, F.L.S.

I have read over the letter addressed to the London Office by Mr. Morris, of Kew, and I think the specimen referred to "China jute" is not jute at all, but Abutilon hemp. I am also of opinion that the article comes from Tientsin.

As the Director of the Royal Gardens at Kew seems anxious to obtain information concerning the plants producing textile fibres in China, and as there is much doubt regarding the various kinds of so-called hemp and jute in China, different products bearing the same name, and the same product having different names at different ports, I take the present opportunity of preparing a statement of the extent of our present knowledge of the subject. While, on the one hand, this statement might assist the Director at Kew in showing him the direction in which information is to be sought; on the other, it may be of some service to the Inspector-General at any time that he may wish to have the subject gone into by his officers in China. The subject is of considerable importance, I should say, both on the commercial and scientific sides.

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A.—*The Plants producing Textile Fabrics in China.*

In Chinese the character *Ma* is generic of plants producing textile fabrics; and the following kinds are distinguished both by colloquial and book usage [*Ma* also includes certain plants the seeds of which are used for their oil, and also certain herbs the foliage of which simulates hemp in appearance; but with these we have at present nothing to do] :—

1. *Ta Ma*, of books; *Hsiao Ma*, colloquially in North China, because there the castor-oil plant is spoken of as *Ta Ma* ("large *Ma*"), from its stature; *Huo Ma* colloquially in South China.

These names indicate common or Russian hemp, the product of *Cannabis sativa*, L.

So far as my experience in Hupeh goes, this plant is chiefly cultivated there for the oil from its seeds, and for coarse fibres used in making cordage; and is not apparently used for making cloth or canvas. But in other provinces of China it doubtless is manufactured into cloth, and information on this point is desirable.

2. *Ch'ing Ma.*—This is Abutilon hemp, the product of the plant known to botanists as *Abutilon Avicennæ*, Gærtn. It is commonly cultivated in Hupeh and Szechwan, and is the greater portion, if not all, of the "hemp" passed through the Ichang Customs. According to Bretschneider, it is also cultivated in Chihli; and I have little doubt it is what is passed through the Tientsin Customs as "jute." In support of this I find in a Customs publication that all the hemp exported from Tientsin is called by the Chinese *Ch'ing Ma*, and by the foreign merchants "jute." But there is some confusion between this and the next article, as will be shown.

3. "*Huang Ma.*"—This is "Indian jute," the product of *Corchorus capsularis*, L. The plant is figured in Chinese books, and, according to the Vienna Exhibition Catalogue, its fibre is exported from Shanghai. Loureiro mentions it for Canton, and Dr. Faber says it is cultivated in Szechwan under the name *Pai Ma*. This name is given in the Chinese Herbal, the *Pên-ts'ao* as a synonym of *Ch'ing Ma;* and it would seem, then, that Abutilon hemp and jute are liable to be confused by the Chinese. Perhaps some of the Ichang and some of the Tientsin export may be "Indian jute."

4. *Ch'u Ma.*—This is *Boehmeria nivea*, Hook. et Arn., Rhea fibre or China grass, out of which most of the so-called Grasscloth (in Chinese "*Hsia Pu*") is made. It is cultivated in Szechwan, Hupeh, Kiangsi, and various other provinces. The Kiukiang Trade Reports for 1868, p. 29, and 1869, pp. 115, 118, give the information that the "hemp" exported from Kiukiang is produced in the districts of Shui-ch'ang in Kiangsi, Hsing-kuo and Wusüeh in Hupeh, and, besides what is exported, a large quantity is locally woven into grasscloth. The 1869 Report, p. 118, enters into the question of grasscloth and its manufacture from the "hemp," and gives tables showing the extensive exportation, &c.

From this it would seem that the "hemp" exported from Kiukiang is really Rhea fibre; and I believe a large portion of the Hankow export of "hemp" is the same fibre.

The Paris Exhibition Catalogue, No. 1673, Hankow, gives *Ssŭ Ma*. This probably is also Rhea fibre.

5. *Hu Ma.*—This is flax (*Linum usitatissimum*, L.) which is cultivated in Shansi, in Mongolia, and in the mountainous parts of Hupeh

and Szechwan. In the last two provinces, from personal observation, flax would seem to be entirely cultivated for the seeds, which are a common article in Chinese drug shops, and are used locally for their oil, utilised for cooking and lighting purposes.

So far as I know, the Chinese do not make any linen.

6. *T'ung Ma*, a local product of Hupeh, and of no commercial importance.—It consists of the fibres obtained from the bark of young trees of *Sterculia platanifolia*, L. f., by steeping them in water. This "hemp" is used for making cordage, and a specimen of it, procured by me, is in the Museum at Kew.

7. *Po-lo Ma*, "Pine-apple Hemp."—This is made into a fabric called *Huang-li Pu* in Formosa (*huang-li* being the local name there for "pine-apple"). The Customs Report for 1876, Takow, p. 98, says this is a strong coarse fabric made from the fibres of the pine-apple leaf, and it resembles the coarser kinds of grasscloth. It is used (in Formosa) almost entirely in the manufacture of inner garments and of the single garment worn by agriculturists in the warm weather.

The Kiungchow Report for 1883, p. 361, says that hemp was exported from Hainan by steamer in that year to the value of Hk. Taels 18,000 (803 piculs in quantity), and that most of this so-called hemp, which is in reality the fibre of the pine-apple plant, finds its way to Swatow, where it is manufactured into a very fine grasscloth.

The export called "hemp" from Hainan and Formosa is evidently, then, the fibre best distinguished as "Pine-apple Hemp."

8. *Fan Pu*, *i.e.*, "Savage Cloth."—This is, according to the Takow Trade Report for 1876, p. 98, a kind of grasscloth worn by the inhabitants of Formosa. It is manufactured by the aborigines, and is finer and more expensive than the Pine-apple cloth. It is sold in the shops of Taiwan-fu; the better kind sells for as much as 8 dollars for a piece, sufficient for making a single garment.

It is very desirable that information should be obtained regarding the plant from which this dear article is produced. Particulars regarding its mode of preparation, &c., are also wanted.

B.—*Concerning the different Names of these Textiles in common Use, and their Export from the various Treaty Ports.*

We find the following information embodied in various Customs publications:—

1. The "hemp" exported from Tientsin is called "jute" by the foreign merchants there, and *Ch'ing Ma* by the Chinese; and is allowed to pass at the rate of 2 mace per picul, other kinds of "hemp" paying 3½ mace. No ports but Tientsin and Shanghai seem to export "jute."

2. "China Grass," "Rhea," or "Raw Hemp," *i.e.*, the raw fibre roughly stripped from the stem in "ribbons." An export from Hankow; pays an *ad valorem* rate of 5 per cent.

3. "Hemp Skin," *Ma-p'i*. An export from Amoy; pays 5 per cent. *ad valorem*. I cannot say what kind of hemp this is, nor what is the plant from which it is derived, and information on this point is very desirable.

4. "Pine-apple Hemp." The tariff for "hemp," *i.e.*, 3½ mace, is levied.

5. *Export from the different Ports.*—I roughly summarise, with running notes, from the Customs Returns for 1889 :—

Tientsin.—Export for that year of 13,619 piculs of "jute." I consider this to be really Abutilon hemp; Chihli is the province of production.

Ichang.—1,506 piculs of "hemp" exported in 1889. This is mainly Abutilon hemp, though some "Indian jute" may be included. Produced in Szechwan. Always called *Ch'ing Ma* on the Ichang Customs documents.

Hankow.—105,278 piculs of "hemp" exported in 1889. No distinction is made in the return between Abutilon hemp, Russian hemp (if any), jute, or Rhea fibre. A certain portion is unquestionably Abutilon hemp from Szechwan and Hupeh, and the larger part is "Rhea fibre" from Hupeh.

Kiukiang.—25,704 piculs exported in 1889; all called "hemp." This is probably all Rhea fibre from Hupeh and Kiangsi.

Wuhu.—290 piculs of "hemp" exported in 1889. Produced in Anhwei, and perhaps Rhea fibre.

Chinkiang.—1,059 piculs "hemp." It is doubtful what this really is.

Shanghai.—390 piculs "hemp," and 21 piculs "jute," of local production. What are they?

Ningpo.—264 piculs "hemp skin."

Foochow.—52 piculs "hemp."

Takow.—1,374 piculs "hemp" (this is "pine-apple hemp"), and 541 piculs "hemp skin."

Amoy.—6,215 piculs "hemp skin."

Swatow.—10,916 piculs "hemp skin."

Kowloon.—913 piculs "hemp" and 1,643 piculs "hemp skin."

Lappa.—2,355 piculs "hemp," and 1,720 piculs "hemp skin."

Kiungchow.—983 piculs "hemp." This is "pine-apple hemp," and is produced in the island of Hainan.

From the southern ports, it will be noticed, there is a larger export of "hemp skin," a very ill-sounding name. It is, probably, an undressed hemp, and may be the product of the common or Russian hemp plant; but the point ought to be elucidated, and a better English name substituted.

C.—*Points requiring elucidation.*

1. What is the export from each port of the different articles properly classified as being *Russian Hemp*, *Abutilon Hemp*, *true Jute*, *Rhea fibre*, *Pine-apple Hemp*, &c.?

2. What is "hemp skin"?

3. From what plant is the "Savage Cloth" of Formosa made, and what is the process of manufacture, &c.?

4. Grasscloth ought to be distinguished according as it is made from Rhea fibre, Pine-apple hemp, &c.

5. Are there any other plants than those mentioned which yield textile fabrics in China of any commercial importance?

6. Specimens of the "jute plant," especially in fruit, are required, as the species *Corchorus capsularis*, L., is not settled beyond the shadow of a doubt.

7. Particulars regarding the place of production, the manner of cultivation, and preparation, are wanted, &c., &c.

(Signed) AUGUSTINE HENRY.

London, October 15, 1890.

FOREIGN OFFICE to ROYAL GARDENS, KEW.

SIR, Foreign Office, March 25, 1891.

WITH reference to your letter of the 26th of November last, I am directed by the Marquis of Salisbury to transmit to you a copy of a despatch from the Acting British Consul at Wênchow, including a report on Rhea cultivation in China.

A copy of a further despatch from Mr. Hosie transmitting a report on another textile plant, is also enclosed.

Mr. Hosie states that a case of specimens illustrative of his reports will be forwarded direct to Kew Gardens. * * * *

I am, &c.
(Signed) T. H. SANDERSON.

W. T. Thiselton Dyer, Esq., C.M.G.,
Kew Gardens.

[Enclosure.]

ACTING CONSUL HOSIE to the MARQUIS OF SALISBURY.

MY LORD, Wênchow, January 26, 1891.

IN connexion with my preceding despatch of this date, I have the honour to enclose a brief Report on another textile plant cultivated in this neighbourhood. It is to all appearances a species of *Abutilon* [since determined as *Corchorus capsularis*, L.]; but its lanceolate and glabrous leaves, its rugose awnless capsules, and its general appearance and size distinguish it from any *Abutilon* that I am acquainted with, in the Flora of China or of India.

I was reserving these brief notes until I had collected more detailed information; but as I am under orders to proceed to Chefoo, and as it will therefore be impossible for me to conduct further experiments with the plant during the present year, I venture to forward the Report, brief as it is, in the hope that it may be of some interest to the Director of Kew Gardens.

* * * * *

I have, &c.
(Signed) ALEXANDER HOSIE,
Acting Consul.

The Marquis of Salisbury, K.G.

REPORT on the CULTIVATION, at WÊNCHOW, of a FIBRE PLANT, and on the EXTRACTION and USES of its FIBRE.

Cultivation.

The seeds of this fibre plant, called *Lu Ma* in the neighbourhood of Wênchow, are sown in May. The ground having been made into beds in the usual Chinese fashion, shallow openings from nine inches to a foot apart are made in the surface by hand or hoe. Into each opening a pinch of seeds is dropped, and covered with a little vegetable ashes. When the young plants appear they are manured once with liquid manure, and when about an inch high they are weeded out, not more than three plants being allowed to grow together. When a foot high they are again manured with liquid manure. In July, small yellow flowers appear on the stems, which have meantime grown to a height of five or six feet, and quickly dropping their petals give place to clusters of seed capsules, usually three in number and firmly attached to the

stems. The latter continue growing and flowering until the end of August, blossoms showing on the tips when the seed capsules beneath are fully developed. By this time the stems have attained a height of 9 to 12 feet, with a circumference at the base of from 2 to 3 inches, and with branches commencing some 3 feet from the ground. The stems, which are green and supple throughout, are harvested before the seed capsules have changed colour, that is, before green has given place to brown.

Harvesting.

They are plucked up by the roots, the adhering soil being removed by beating against the nearest stone, and where I saw the stems harvested, the roots were thoroughly washed in a pond close to the field.

Decortication.

Two men are required to remove the peel. One takes hold of the plant by its branches, the other seizes the stem below the first branch between two rounded pieces of wood about a foot long and from three to four inches in circumference, tapering somewhat towards the end so as to provide a firmer grip for the hands. The first workman pulls the stem through the two pieces of wood which crush it, separate the peel from the central woody matter, and remove the root. The plant is then reversed and the branches are pulled through the wooden handles and crushed, and the leaves and seed capsules dislodged. The woody matter that has not meantime fallen to the ground is brushed away by hand, and the peel of stem and branches is ready to be made into bundles for market.

Uses.

Such is the treatment which the plant receives when the fibrous peel is to be made into cordage; but, when it is to be manufactured into sacking or coarse cloth, the plants, when harvested, are steeped for a day in cold water, and, when manipulated as above described, much of the outer cuticle is removed in the process, and when bleached, a whiter fibre is obtained.

The plant grows luxuriantly on the plains; but I have also seen it cultivated at an altitude of over 1,300 feet.

* * * * * *

(Signed) Alex. Hosie,
Acting Consul.

H. B. M. Consulate, Wenchow,
January 26, 1891.

Royal Gardens, Kew, to Foreign Office.

Sir, Royal Gardens, Kew, May 5, 1891.

I am desired by Mr. Thiselton Dyer to acknowledge the receipt of your letter of the 25th March enclosing copies of despatches, in original, received from the Acting British Consul at Wenchow, on certain fibre plants.

2. The specimens illustrative of Mr. Hosie's reports have since been received at Kew, and they are all of an interesting character. The specimens referred by Mr. Hosie "to a species of Abutilon" and "called in the neighbourhood of Wenchow *Lu Ma*," have proved to

belong to *Corchorus capsularis*, L., the plant yielding Indian jute. It would therefore be better to call this fibre simply "China jute." There is a fibre yielded by a species of Abutilon, but this appears to come from Northern China. * * * *

I have, &c.

Sir Villiers Lister, K.C.M.G., (Signed) D. Morris.
Foreign Office, S.W.

Acting Consul Hosie to Foreign Office.

My Lord, Chefoo, September 5, 1891.

With reference to the enclosure in your Lordship's despatch to me of June 5th last, wherein the Assistant Director of the Royal Gardens, Kew, mentions a plant grown in North China which yields a fibre known in the London market as China jute, I have the honour to forward herewith a brief report on the cultivation of the plant in question, and on the method of extracting the fibre.

I am sending direct to Kew, by parcel post, dried flowering and fruiting specimens of the plant, a packet of seed, and a sample of the fibre.

The only other plant cultivated in this neighbourhood for its fibre is *Cannabis sativa* or Russian hemp.

I have, &c.

(Signed) A. Hosie,
Acting Consul.

The Marquis of Salisbury, K.G.,
Foreign Office.

[Enclosure.]

Report on the Cultivation of a Fibre-yielding Plant at Chefoo.

This plant, known in the north of China as *Ch'ing Ma*, or more briefly *Ch'ing*, yields the fibre, also called *Ch'ing*, which appears as "jute" in the export returns of the Imperial Maritime Customs. It is an annual. The seeds are sown towards the middle of April in land that has previously been well worked and manured, several seeds being sown together at intervals of about a foot apart, and not more than an inch under the surface. Unless, however, the soil is rich, only one of the seedlings is allowed to mature. In years of normal rainfall the stems, which are branchless with alternate large smooth serrated ovate acuminate green leaves with long leaf-stalks, attain a height of eight to ten feet. They are green and supple throughout, with a circumference at the base of from $1\frac{1}{2}$ to $3\frac{1}{2}$ inches. In July and August they bear numbers of yellow five-petalled flowers on stalks, which spring from the axils of the leaf-stalks. These quickly fall, and are succeeded by seed capsules of comparatively large size, grooved, and semi-spherical in shape. Each capsule is made up of a number (11–15) of cells, with awns at the upper ends curving down, and into the centre of the capsule. Each cell contains three seeds, which, white at first, assume when ripe a dark brown colour. The latter, which have the appearance of each having had a notch made in it, are released at the proper season by the opening of the outer and upper walls of the cells. Towards the end of August the plants have attained maturity. They are then cut down by knife near the root, and the leaves and tips are lopped off. The stems are made up into bundles tied loosely at the tip end, and placed upright in

standing water, so that only the lower halves are submerged. The root halves being more matured than the upper require more retting, and for this reason they undergo two days' preliminary sleeping. After the lapse of two days the bundles are laid on their sides in the water, and covered with sufficient earth to sink and bring them in contact with the bottom of the pond. In four or, at the most, five days the fibrous peel is loose enough to be easily removed by hand from the woody interior. The fibre ribbons, which have now all but lost their green colour, are afterwards washed in clean cold water and spread out in the sun, and when dry they are of a good white colour, such of the external greenness as remains after the retting and washing disappearing in the process of drying.

These remarks apply to the plant as cultivated at Chefoo, but I am informed that in other parts of this province and in the Mongolian hills the stems attain a much greater height and yield a longer fibre. The fibre exported from Tientsin, for example, much of which probably comes from Mongolia, is sometimes found to be as much as fifteen feet in length, whereas the plant itself does not attain that height in the light sandy soil near Chefoo.

The table annexed to this Report* gives the climatic conditions under which the plant is cultivated here.

(Signed) Alex. Hosie,
Acting Consul.

H. B. M. Consulate, Chefoo,
September 5, 1891.

Royal Gardens, Kew, to Foreign Office.

Royal Gardens, Kew,
November 23, 1891.

Sir,

I am desired by Mr. Thiselton Dyer to acknowledge the receipt of your letter of the 21st ultimo, forwarding a copy of a despatch and report by Mr. Hosie, Acting Consul at Chefoo, on the subject of a fibrous species of *Abutilon* yielding Chinese jute.

2. The specimens mentioned by Mr. Hosie and sent direct to this establishment have now been received. These specimens were admirably prepared, and taken with the report they definitely settle the question raised in my letter of the 5th May last in regard to the origin of Chinese jute from Northern China. The plant yielding it is *Abutilon Avicennæ*, Gærtn., a widely diffused species in Eastern Asia.

3. Mr. Thiselton Dyer would express the hope that Mr. Hosie may be thanked for the very intelligent manner in which he has prosecuted his inquiries in this matter, and for the valuable assistance he has afforded to this establishment.

I have, &c.
(Signed) D. Morris.

Sir T. H. Sanderson, K.C.M.G.,
Foreign Office, S.W.

Royal Gardens, Kew, to Foreign Office.

Sir,

July 17, 1891.

I am directed by Mr. Thiselton Dyer to inform you that he has read with interest the Report on the Trade of Kiungchow for the year 1890, by Acting Consul Parker [F. O. Annual Series, 1890, No. 898],

* Not reproduced.

and the numerous references contained in it to the plants and plant-products noted by him in the journey inland up the Poh Chung river.

2. Mr. Parker states on page 9 that "another peculiarity of this "region is the ubiquitousness of the dwarf *Pandanus*, probably the "same as the *P. odoratissimus* of Fiji, the fibre of which here, as there, "is used in the manufacture of 'grass-cloth,' and is usually known to "foreign trade here as 'hemp.'" In the marginal note this is described as "cloth from the wild pine-apple."

3. As the various plants yielding what is locally known as "hemp" in different parts of China are now in course of being investigated at Kew, Mr. Thiselton Dyer would be glad to receive dried specimens of leaves of the *Pandanus* described by Mr. Parker, and also specimens of the fibre as it usually appears in trade at Kiungchow. The latter would be placed for reference in the Museum of Economic Botany attached to this establishment.

I have, &c.
(Signed) D. Morris.

Sir Villiers Lister, K.C.M.G.,
Foreign Office, S.W.

Foreign Office to Royal Gardens, Kew.

Sir, Foreign Office, November 4, 1891.

With reference to the letter from this Department on the 23rd of July last, I am directed by the Marquis of Salisbury to transmit a Memorandum drawn up by Mr. Parker, Her Majesty's Consul at Kiungchow, showing that the hemp exported from the above-mentioned place is made from the fibre of the pine-apple, and not of the *Pandanus*.

The parcel of specimens alluded to in Mr. Parker's Memorandum has not yet arrived, but will be forwarded directly it is received.

I am, &c.
(Signed) T. H. Sanderson.

W. T. Thiselton Dyer, Esq.,
Kew Gardens.

[*Enclosure.*]

Report by Mr. Consul Parker, Kiungchow.

The inquiry instituted by the Kew authorities has led to the discovery that the finer kinds of "hemp" which are exported hence are the fibre of the pine-apple, and not of the *Pandanus*.

Mr. Stuhlmann, in his Customs Report for 1877, does, indeed, mention this "pine-apple fibre," other two Commissioners refer to it as "hemp." Mr. Commissioner Neumann, in his Report for 1889, says:—"What is "exported under the name of hemp is the fibre of the pine-apple plant "(*Pandanus*); it comes principally from the Lei-chou peninsula, and "realises as much as $40 to $140 the picul" [1*s.* to 3*s.* a pound].

From the appearance of the ubiquitous *Pandanus*, I should suppose it to be the same plant as the *Pandanus* of Fiji, which colony I have recently visited. I now find, however, that the Fijians only make mats, not clothing, out of the *P. odoratissimus;* and that the *Pandanus* of Hoihow is useless except for hedgerows and fuel. It is said that, somewhere inland, mats are made of it here, and that its root is used in the Pharmacopœia as a febrifuge. Parcel No. 4 contains a few leaves of this plant, and the tin box contains its fruit, which seems to mature from April to September at least, if not all through the year.

Parcel No. 2 contains leaves of the plant from which the so-called "hemp" is manufactured. These come from *Mun-shio* or *Wên-ch'ang*, a district a few days' journey to the east, which district appears to be the only one upon this island where pine-apple "hemp" and the cloth from it are manufactured.

Parcel No. 1 contains the leaves of a pine-apple plant, *grown for the fruit only*, obtained at a village five miles to the west of Hoihow: natives of *Mun-shio* in my service assert that this is the same as the pine-apple of *Mun-shio*, the fruit of which, though eaten, is of secondary consideration there.

Parcel No. 3 contains imperfect leaves of the pine-apple plant of the *Lei-chow* peninsula, opposite Hoihow, from which the natives there are *said* to manufacture a "grass-cloth," which is *supposed* to be brought over here in junks for export hence.

Parcel No. 5 contains a leaf of the plant (no whereabouts given) from which the Customs here were convinced the local "grass-cloth" was made: they supposed it was the *Pandanus*, until I proved to them that it was not. The *Pandanus* has a prickly seam down the centre of the leaf.

The leaf of the pine-apple is first scraped with a bamboo knife; it is then torn apart, and washed in cold water in which rice has been washed. It is next dried in the sun and aired at night; after which the skeins are combed, and the ends of each thread are joined, by a twist of the fingers, to each other. The material is then sized with rice-gruel, drawn through bamboo tubes, and cleaned of its knots, joinings, and protuberances.

Parcels Nos. 5A, 6, 7, 8, 9, and 10 represent the pure pine-apple fibre in its various stages. Nos. 6, 7, 8, 9 appear to be mere qualities of No. 5A, each of which is capable of becoming No. 10 if sufficient labour is given to it.

Parcel No. 11 contains specimens, with prices, of pure pine-apple "grass-cloth," presumably corresponding in quality to Nos. 6, 7, 8, or 9.

Parcel No. 12 contains a mixed web of ordinary cotton and pine-apple fibre interwoven.

Parcel No. 13 contains specimens of hemp and hemped cloth from *Mun-shio* by way of contrast.

(Signed) E. H. PARKER,
Consul.

Kiungchow, December 22, 1891.

ROYAL GARDENS, KEW, to FOREIGN OFFICE.

SIR, Royal Gardens, Kew, November 26, 1891.

I AM desired by Mr. Thiselton Dyer to acknowledge the receipt of your letter of the 4th instant forwarding a memorandum drawn up by Mr. Parker, Her Majesty's Consul at Kiungchow, on the subject of pine-apple fibre prepared at the above-mentioned place.

The parcel of specimens alluded to in Mr. Parker's memorandum having arrived at Kew, it has been carefully examined in accordance with the information furnished in this and the previous correspondence.

There can be no doubt that the leaves sent by Mr. Parker are those of the pine-apple plant (*Ananas sativus*, Baker), and the fibre corresponds with that usually yielded by members of the pine-apple family.

The Pandanus represented by leaves and one fruit, is, as Mr. Parker supposed, *Pandanus odoratissimus*, a native of tropical Asia. The fibre prepared from the leaves of the Pandanus is usually of poor quality, and it could not be mistaken for that of the pine-apple. The specimens forwarded by Mr. Parker were carefully put up and labelled, and, taken with his memorandum, they may be considered to have definitely settled the point at issue. Mr. Thiselton Dyer would venture to express the hope that the Secretary of State will communicate the thanks of this establishment to Mr. Parker for the very intelligent manner in which he has assisted in this inquiry.

I have, &c.
(Signed) D. Morris.

CCXIX.—IPOH POISON OF THE MALAY PENINSULA.

(*Antiaris toxicaria*, Lesch.)

In the *Kew Bulletin* for February of the present year, some account was given of the investigations which at different periods during the past 10 years have been carried on through Kew on the Ipoh poison of the Malay Archipelago. The results are summed up in the following paragraph :—

"The facts as they stand present a rather curious puzzle. There can be no doubt that in Java the Upas tree furnishes a very effective arrow poison. It may be inferred that its use originated in Java and some of the other Malay islands. Finding the same tree on the mainland the Malays used its juice. But they must have long since discovered that it is innocuous. According to Griffith they remedy the defect with arsenic. If this is really done it must be when the arrows are prepared; for two authentic specimens of Ipoh poison from the Malay Peninsula were absolutely inert, and contained none of the poisonous principle Antiarin."

To these conclusions, which appeared justified by the facts which were received at the time, the Government of Perak is unable to assent, and the Curator of the Perak Government Museum has sent to Kew an extremely interesting report, and an admirable series of specimens, which will enable the whole subject to be re-investigated.

Mr. Wray's report is now printed with his accompanying letter in advance of the results of the examination of the presumed poisonous fluids, which has been again kindly undertaken by Dr. Sidney Ringer, F.R.S., Professor of Clinical Medicine, University College, London.

Mr. Leonard Wray, Junior, Curator of the Perak Government Museum, to Royal Gardens, Kew,

Perak Museum, Larut, Perak, Straits Settlements.
Dear Sir, (Received 8 October 1891.)

I was much interested in your paper in the *Kew Bulletin* on Ipoh, and believing, from what I have seen and heard, that, from causes which it is hard to understand, the specimens and information on which you based your conclusions were unreliable, I obtained the permission of the British Resident of Perak to investigate the subject, and I now

enclose a paper containing the results of my inquiries for insertion, if you think it of sufficient importance, in the *Kew Bulletin*.

I have also sent a box containing a number of specimens illustrating this paper, together with a few others which you may like to have for your museum, and I now enclose a list of the contents of this box.

If you would kindly examine the botanical specimens I send, and add a few remarks on them, it would make the paper much more valuable. I have very likely already collected specimens of the three plants from which *ipoh aker* is obtained, and you may be able to find them in the Kew Herbarium, as Dr. King sends duplicates of my plants to you.

If you could also get someone to try a few experiments with the poisons I send, both as to their effects on animals and the nature of their poisonous principles, the whole question would be finally settled.

As the poisons are all mixed with spirits there is no fear of their becoming inert, and I can guarantee their being the actual poisons used by the aborigines. They will simply require evaporation on a water bath to be in a fit state, with the addition of a known quantity of water for injection. If a fatal result is required about one grain of the dried poisons should be used.

I will write again about the live plants I am sending you, and am

Yours truly

(Signed) L. Wray, Junior.

W. T. Thiselton Dyer, Esq., C.M.G., F.R.S.,
Director of the Royal Gardens, Kew.

P.S.—I am much obliged to you for the determinations of the Musci and Hepaticæ which I received by last mail.

Ipoh and other Arrow-poisons used by the Aborigines of Perak, in the Malay Peninsula.

There are two tribes of aborigines in Perak who use arrow-poison, viz., the Semangs and the Sakais. The former people, who live in the north of Perak, use both blowpipes and bows and arrows; while the latter, who live in the southern part of the State, use blowpipes only.

I recently visited Ulu Selama, where some of the Semangs live, and was taken by them to a place called Kuala Jah, at, I should estimate, 500 feet elevation, where I was shown, growing in the virgin forest, within 100 yards of one another, two large Ipoh trees. The larger was about 5 feet in diameter at 5 feet from the ground, and had a trunk full 100 feet in height to the first branch. It had been tapped many times, the bark being deeply scored up to a height of 25 feet from the ground; the smaller tree was also scored all over. The bark externally is white, and internally orange-brown, and is very thick and fibrous. On cutting fresh scores into the bark, the dirty whitey-brown sap ran very sparingly out, and was conducted down palm leaves stuck on to the trunk of the tree with clay, into bamboos. The scores are cut slanting alternately right and left, like what is known as herring-bone stitching, with the lower ends of the scores pointing inwards. At the bottom of each series of scores is put a leaf, fastened to the bark with clay, to lead the sap which trickles down into a bamboo. We only succeeded in getting about 3 ozs. of sap the first day; but two days afterwards, by erecting a scaffolding around the tree and extending the scores up the trunk we got about one pint. Three ounces of sap, the Semangs said, was enough to poison 100 blowpipe arrows.

The sap having been collected from the trees, a spatula-shaped piece of wood was taken and heated over a clear wood fire, and a small quantity of the sap poured on it and spread out with another but smaller wooden spatula, and held over the fire till nearly dry, and the process repeated till all the sap was evaporated. There remained on the spatula a dark brown gummy substance, on which the points of the arrows were rubbed three times, being dried over the fire between each application of the poison. This simple process completed the preparation of the poison; but as there are sometimes other things mixed with the Ipoh, I shall return to this part of the subject again.

The sap, which I found to be bitter and biting in taste and decidedly acid to test paper, on exposure to the air quickly darkens to a brown colour, and it yields when dried on a water-bath 29 per cent. of solid Ipoh. This substance, if put thinly on a slip of glass and examined by a microscope, is seen to contain numerous crystals of antiarin.

A portion of the sap was mixed while fresh with its bulk of spirits of wine, to prevent its decomposition, and corked up, samples of which are forwarded to the Director of the Royal Gardens, Kew, with this paper, marked Nos. 12 and 13. I also obtained leaves from the larger of the two trees, which are marked No. 6, and the dried poison on the spatula, marked No. 23, as well as leaves of a young Ipoh tree, marked No. 5. These latter are decidedly pubescent, while those from the large tree are glabrous. There were neither fruit nor flowers on the trees, but I sent to Kew fruiting specimens of the Ipoh in 1883, which were pronounced by the present Director of the Gardens to be identical with the Javan specimens of *Antiaris toxicaria* in the Kew Herbarium. The trunk of the tree from which these specimens were obtained was also much scored, showing that its sap had been collected by the aborigines. Specimens of this tree were also communicated to Dr. G. King at the Botanical Gardens, Calcutta, who identified it as *A. innoxia*.

It may be mentioned in reference to the two kinds of Upas distinguished by Blume as *Arbor toxicaria femina* and *mas*, that the latter word, which is Malay, means "gold" and not "male" as inferred in the former paper. It is so called from the golden colour of the inner bark. In the innocuous variety, I was informed by the Semangs, the inner bark is blackish coloured, and it is by the colour of the inner bark that they distinguish the poisonous from the non-poisonous trees.

From some of the sap collected in Ulu Selama, I have separated the poisonous principle antiarin, a small tube of which containing 4·6 grains, being the amount obtained from one fluid ounce of the sap, accompanies the other specimens (No. 21).

The process I employed to isolate the alkaloid was that quoted from Watt's Dictionary of Chemistry in the paper on Ipoh in the *Kew Bulletin*, and is briefly as follows:—

Evaporate to dryness on a water bath the mixed sap and spirits of wine, add water, heat, filter, wash filter with hot water, evaporate filtrate and washings to a syrup and allow the antiarin to crystallize; purify by re-crystallization.

The antiarin appears as minute diamond shaped crystals, many of which have the obtuse angles replaced.

The so called antiar-resin, when separated from the fresh sap, is nearly white and much resembles caoutchouc, though it doubtless assumes a resinous appearance on long exposure to the air. One fluid ounce of the sap yielded 17·5 grains of antiar-resin, a small sample of which is marked No. 22.

By Watt's method of separation just detailed it is only possible to isolate a portion of the antiarin contained in the fresh sap, owing to the large amount of extractive matter present in the solution, and I found it necessary to modify the process by precipitating the extractive matter by acetate of lead, filtering, precipitating any excess of lead with sulphuric acid, neutralising the free acid with carbonate of lime, filtering and evaporating the filtrate (which should be colourless) on a water bath till the antiarin crystallizes out. Then freeing the crystalline mass from any sulphate of lime which may be present by dissolving it in spirits of wine or ether and re-crystallizing the now pure antiarin.

One fluid ounce of the Ipoh sap I found to yield, when so treated, 10·85 grains of antiarin, or 2·482 per cent. The dried Ipoh poison, of which the sap contains 29 per cent., therefore has 8·561 per cent. of antiarin in it, separable by the above process.

With the imperfect laboratory appliances at my disposal these results cannot be considered as more than estimates of the total amount of poison present; and unfortunately I have no analysis of Upas with which to compare them.

As the result of weighing coated darts and washing off the poison and re-weighing, the amount of Ipoh on them may be taken to be rather less than one grain, and by the estimate above given this weight of the dried poison would only contain ·086 of a grain of the alkaloid; which, however is sufficient to produce a fatal result when introduced into the circulation of an animal weighing as much as 20 pounds.

On the afternoon of the day on which the sap was collected I tried the following experiments with it on two fowls.

Experiment 1.

June 9, 1891.—Three minims of the fresh sap was injected hypodermically with a syringe, without drawing blood, into the leg of a fowl.

In three minutes the leg was affected and the bird was rather lame, but for half-an-hour remained otherwise quite well, eating freely and walking about. It then became rather dull and sluggish, and voided at very frequent intervals.

Twelve hours after the injection it was apparently not much the worse for the operation, but a large dark patch had formed where the injection had been made, covered with loose skin and surrounded by extensive inflammation, and radiating from it were several enlarged blood vessels.

Twenty hours after it was very lethargic.

Forty-two hours after the inflammation was subsiding, but the bird was still very dull, though I have no doubt of its ultimate recovery, but as I had to leave the place, could not continue observations on it.

Experiment 2.

June 9, 1891.—A poisoned dart point, which had been prepared before me from the same sap, was stuck into the leg of a fowl and slight lameness and diarhœa came on, but no other symptoms.

A second arrow was stuck into the other leg after half an hour had elapsed, but hardly any effect followed.

Twelve hours afterwards dark patches surrounded the wounds, and there was extensive inflammation of the adjacent parts and considerable

inflation of the sides and upper part of the body by air close under the skin.

Twenty hours after it was lethargic, but not so ill as would be expected by the local symptoms.

Forty-two hours after, still lethargic, but the inflammation subsiding and the skin round the wounds assuming a greenish hue. Further observation could not be made, but I think its recovery was certain.

In regard to these two experiments, the Semangs said that neither fowls nor argus pheasants are affected by the poison, and that as many as ten darts may be stuck into one of these birds without causing its death. It therefore became necessary to try an experiment on a susceptible animal, and a full grown cat was used for that purpose.

Experiment 3.

June 10th, 1891.

2.3 PM. Dart similar to those used in experiment 2, stuck into the cat.

2.13 PM. Diarrhœa and vomiting began.

2.20 PM. Convulsed.

2.22 PM. Dead.

As the poison used in this experiment was that collected and prepared in my presence the day before, the virulence of the Malayan *Antiaris toxicaria* is proved beyond the shadow of a doubt. The poison seems to be as rapid as the Javan Upas, 19 minutes only having elapsed between inoculation and death, while the animal was quite disabled in 10 minutes time.

These experiments also prove the comparative immunity from the effects of the Ipoh poison enjoyed by fowls, which is a matter of considerable scientific interest.

The previous experiments which have been made on samples of Ipoh sent from the Malayan Peninsula, as detailed in the February number of the *Kew Bulletin*, can only be explained in two ways; either the sap brought in by the collectors was the sap of some other non-poisonous tree, or the sap underwent decomposition with consequent destruction of the antiarin contained it it, before reaching the hands of the experimenters in England.

There is no doubt that the material collected in 1881 by Sir Hugh Low, the then Resident of Perak, was quite authentic, as its poisonous properties were tried on some dogs here before it was transmitted to Kew; but the information and material supplied to Mr. D. Hervey was evidently not reliable, for the sap of *Antiaris* is poisonous *per se* as every aboriginal knows, and there is no such thing as "sap of *Ipoh aker*," in the sense in which the expression is used, that poison being an extract prepared from the bark of the plant, as I shall afterwards explain in detail. This extract, had it been sent, would have been very unlikely to decompose, as the Sakais keep it for years and say it does not lose its virulence.

What Griffith says about the poisonous properties of the Ipoh being derived from admixture of arsenic, was information probably derived from the Malays, for the aborigines are quite ignorant of that poison, and as Professor Ringer points out, the action of arsenic is very different

from that of Ipoh, besides which animals killed with arsenic would be quite unfit for food.

I may here observe that it is the aborigines alone who use poisoned weapons in the Peninsula. The Malays put arsenic on their krises and spears, but it is employed solely with the view of bringing out the damaskeening of the blades and not as a poison.

I have had one opportunity of noticing the effects of Ipoh poison on a human being. It occurred while I was descending a river in Upper Perak in 1889, and I made the following note at the time. "While "unloading and carrying the baggage over the rocks, a poisoned blow-"pipe dart fell out of a quiver and stuck into the upper part of one of "the men's feet. It was at once pulled out and a Semang squeezed the "wound to get out as much blood as possible, then tied a tight ligature "round his leg and put lime juice on to the wound. The man com-"plained of great pain in the foot, cramps in the stomach and vomited, "but these symptoms soon passed off. The point only went into the "foot about one-third of an inch, and the dart was instantly pulled out. "The Semangs said that had it gone deep into a fleshy part of the body "it would have caused death."

The blowpipe darts are only about one-twentieth of an inch in diameter, are sharpened to a fine taper point, and are poisoned for a length of nearly one inch and a half, the poison being put on very sparingly near the point, so as not to interfere with their penetrative power. A slight notch is often cut in the dart just below the poisoned tip, so that it may break off into the wound.

As previously stated, besides the blowpipe darts, the Semangs use bows with poisoned arrows. These arrows have detachable fore-shafts, with either barbed iron or hard wooden heads. These heads are about 2 inches long by $\frac{3}{4}$ inch broad, and are thickly coated, except near the point, with poison. I have not seen the effects of one of these arrows on an animal, but the Semangs, amongst whom I lived on one occasion for about three months, say that they are able to kill pig, sambur deer, wild oxen, and even rhinoceros with them, and as I have seen bones of these animals at their camps, there appears to be no reason to doubt the truth of the statement. It was asserted that a deer would drop in from 30 to 40 yards after being struck by an arrow. The rapidity of the action of the poison depending on the vascularity of the portion of the body pierced by the arrow.

I may here mention, as the subject has been referred to in the previous paper, that the bark of the *Antiaris* is used by both the Semangs and Sakais as bark cloth. It is prepared as follows :—A young tree is felled and cut into pieces of suitable length. With a knife the outer portion of the bark is shaved off and the inner bark is beaten with bat-shaped pieces of wood until it will slip off from the stem. The bark is then put into running water, in which it is allowed to remain for the space of one month to free it of the poison; then it is beaten with wooden bats, on one face of which furrows have been cut at right angles to each other, to produce a grain on the finished cloth.

As stated above, the Semangs sometimes mix other poisons with the Ipoh. The plants from which these are derived are known to the Malays as *likir* and *gadong*. In both cases it is the expressed juice of the tubers that is employed. The *likir* is an Aroid belonging to the genus *Amorphophallus*, and the *gadong* is a thorny climbing yam belonging to the order *Dioscoreaceæ*. Botanical specimens of both these plants have been sent to the Calcutta Botanical Gardens, but identifications have not yet been received. A flowering specimen of the

gadong I send with this paper. It is probable that the specimens of *likir* have been transmitted to Kew by Dr. King, in which case they will be found numbered 3327.

The tubers are rasped up fine with a knife, and the soft mass put into a piece of cloth, which is then forcibly pulled through two pieces of stick tied firmly together a short distance apart, so that the juice, which is very acrid, is expressed without coming in contact with the hands. The juice of the *likir* and *gadong* tubers so obtained is mixed with the Ipoh sap, and the mixture dried on a wooden spatula over a fire, and the arrows poisoned in the way that has already been described.

The tubers of both these plants, which contain starch in large quantities, are cut up into thin slices and suspended in a basket in running water and allowed to steep until the poison contained in them has been dissolved out. They are then cooked and eaten by the aborigines, and also occasionally by the Malays.

The acrid juices of these plants are said not to be fatal by themselves, and the part they play when mixed with the arrow poison is to cause local irritation, which hinders wounded animals from escaping before the antiarin has time to act; but all the Semangs and Sakais I have asked have said that the pure Ipoh is more deadly than the mixture.

A bottle of *gadong* juice and another of *likir* juice mixed with spirits of wine are included in the collection accompanying this paper.

The juice of the tubers of the *gadong* is decidedly acid when fresh. It smells somewhat like raw potatoes, and is bitter and astringent, producing a stinging sensation on the tongue, and a very unpleasant dry feeling in the mouth, which persists for a considerable time. The acidulated juice yields a yellowish-brown precipitate to a solution of iodine in iodide of potassium. The precipitate re-dissolved in sulphureous acid and evaporated yields long branching needle-like crystals. The juice mixed with spirits, filtered and evaporated to dryness and re-dissolved in dilute sulphuric acid filtered and evaporated again, also yields long branching crystals, which have an astringent taste like the juice, and are possibly the poisonous principle.

The freshly expressed juice of the *likir* tubers is faintly acid to test paper. It smells somewhat like beetroot, and is acrid, and causes irritation if it is applied to the skin. It appears not to contain any alkaloid, as it affords no precipitate when a solution of iodine in iodide of potassium is added to the filtered and acidulated juice, nor when the juice is just rendered alkaline by potash. When distilled, the distilate smells like the juice, and is slightly opalescent, but it does not cause irritation when applied to the skin, or even to a wound. It tastes the same as it smells, and does not injuriously affect the tongue.

To complete this injuiry into the sources of the arrow-poisons of the aborigines, I visited the district of Batang Padang, to ascertain how the Sakais prepare their poison. As previously mentioned they only use it on their blowpipe darts, as bows and arrows are not employed by them.

I visited two Ipoh trees, both of which were deeply scored like those in Selama. The scoring of the bark was not, however, so regular as with the Semangs, and I saw no sign of the herring-bone method. The usual plan was to cut detached V-shaped incisions, and the method of collecting the sap differs also from that already described.

Several pieces of bamboo are taken, and to each is fixed a piece of wood, which is ingeniously cut so that when its chisel-shaped upper end is applied to the bark of the tree below a score the sap flows, first down its upper surface till it meets a cut channel which conducts it round to the under surface, and so into the bamboo receptacle.

The sap being collected, two wooden spatulas are prepared and a piece of large bamboo split in half so as to form a small trough and the sap poured into it. The larger spatula is heated over a fire and the sap ladled out of the bamboo and spread on its heated surface by means of the smaller spatula and dried by being held with the uncoated side over the fire; it is then reversed and sap spread on its upper or uncoated side, and when that is in its turn nearly dry again reversed, and a fresh supply of sap put on to the surface first coated. This is repeated until all the sap has been inspissated.

The darts are coated in the manner before mentioned, and when the poison is very hard and dry and will not soften by being heated, a few drops of water are put on to the spatula and mixed by means of a smaller spatula, with the poison until it acquires the right consistency to apply to the points of the darts.

The Sakai and Semang methods of collecting and preparing the poison are really the same, only differing in details. The Sakais, however, do not mix *likir* juice with the *ipoh* and the way they mix the *gadong* juice with it is not the same as that employed by the Semangs. For this purpose the Ipoh sap is prepared as just described and a piece of the *gadong* tuber is peeled and sliced up fine and placed in a joint of a bamboo, and ground up with water by means of a wooden pestle. The fluid is then poured off and fresh water added and the process repeated. The fluid is then boiled and filtered through leaves in which some fine scrapings of bamboo are put. It is then evaporated in an open vessel over a fire to the consistency of a thick syrup and mixed with the *ipoh* in the proportion of three parts of *ipoh* to one of *gadong*.

The Sakais living in the plains employ the *Antiaris* poison as a rule, as the plants from which it is prepared are low country forms; but the Sakais of the hills use a poison prepared from three hill plants known as *ipoh aker*, or root Ipoh, in contradistinction to the antiaris or *ipoh kayu* (tree *ipoh*). These plants are called *ipoh aker*, *prual* and *lampong*.

Ipoh aker is a large climbing *Strychnos* with a stem often as much as 3 inches in diameter. It has dark green, glabrous, opposite, leaves, with three prominent longitudinal veins. The fruit is said to be large and round and to contain seeds about half inch in diameter and the flower is stated to be reddish. It grows on the hills and I have seen it at over 4,000 feet elevation. The specimens now procured were collected on Gunong Batu Puteh in Batang Padang. The portion of this plant from which the poison is extracted is the bark of the roots and lower part of the stem. It is often employed without admixture and is then prepared as follows:—

The bark, which is burnt sienna coloured, is scraped with knives from the roots; the scrapings are put into a pan with water and boiled, the water is poured off and filtered. Fresh water is added to the bark, which is again boiled for some minutes, and the water poured off a second time. The exhausted shavings of bark are then thrown away, and the filtered infusion, which is bright burnt sienna coloured, is reduced by boiling in an open pan to a syrup. It is then poured while hot into a bamboo, where it solidifies. It is applied to the darts in the manner already explained and is said to be more powerful than the *Antiaris*, but is rendered quicker in its action when mixed with the poison derived from the other two plants above mentioned.

Of these *Prual* is also a climber, growing on the hills. The largest stem I have seen was $1\frac{1}{2}$ inch in diameter. It has opposite bright green entire leaves, but its flowers and fruit I have neither seen nor

been able to get any description of. The young shoots contain a very fine strong, white, silky fibre. My specimens were also collected on Gunong Batu Puteh. The bark of the roots, which is rather pale yellow in colour, is the part of the plant which is employed in making the poison. This arrow poison is said not to be so strong as *Antiaris*, but to be quite capable of killing when used by itself.

The third part is called *lampong* and is also a climbing species of *Strychnos*. It has opposite, three veined leaves like *ipoh aker* only they are considerably smaller, and is stated to have similar fruit, but it grows lower down on the hills, my specimens being collected on the Cheroh hills. Like the two preceding plants, the bark of the roots, which is white, is the part from which the poison is extracted. It is said to be not so powerful as *prual*, but is often employed by itself.

In making the mixed poison six parts of scraped *ipoh aker* bark are taken to which is added one part of each of *prual* and *lampong* bark and the mixture is exhausted with boiling water, filtered and evaporated in the same way as has already been described, when simple *ipoh aker* is treated.

It was stated by the Sakais that *Antiaris* and *ipoh aker* are rarely if ever mixed with one another. The latter poison is said to retain its virulence, in the form of an extract, for years.

Specimens of the roots of these three plants and the extracts prepared from them, are forwarded with the other specimens, so that their toxic effects may be tried in England.

L. Wray, Junr., M.I.E.E., F.Z.S.,
Curator, Perak Government Museum
Thaipeng, August 30, 1891. and State Geologist.

The following specimens were sent by Mr. Wray of the plants used in the preparation of arrow poison in Perak. They have been determined by Dr. Stapf, Assistant for India in the Herbarium of the Royal Gardens.

1. *Ipoh* leaves. Bottom branch of a large tree. Cheroh, Batang Padang.
Antiaris toxicaria, Lesch.

2. *Lampong* leaves. Climber from Gunong Batu Puteh, Batang Padang.
Strychnos Maingayi, Clarke (?).

3. *Ipoh Aker* leaves. Climber from Gunong Batu Puteh, Batang Padang.
Strychnos sp., closely allied to *S. Maingayi*, and probably only a different state of it.

4. *Prual* leaves. Climber from Gunong Batu Puteh, Batang Padang.
Rubiacea, possibly a *Lasianthus* or *Urophyllum*.

5. *Ipoh* leaves. Young tree. Ulu Selama.
Antiaris toxicaria, Lesch.

6. *Ipoh* leaves. Upper branch of a large tree.
Antiaris toxicaria, Lesch.

7. *Gadong.* Flowers pale green, leaves light green, climber with large tubers.

Dioscorea hirsuta, Bl. (D. dæmona, *Roxb.* var. *reticulata*, Hook. f. *MSS.* in Herb. Kew).

Leschenault mentions (Ann. d. Mus. d'hist. nat. xvi. 469) the use of the root of *Dioscorea triphylla* (D. hirsuta, *Bl.*) as one of the components of the Ipo, prepared by one of the Orang-daias from Borneo. There is also a note in the Kew Herbarium on a sheet with *Dioscorea* (Motley, 729, Bangaramassing, Borneo), as follows:—Dry hills, woods, &c., common. Malay *Gadung;* flowers green; the roots are eaten, but undergo an elaborate preparation being very poisonous in a fresh state.

Dr. Stapf notes that in 1880 the Conde de Ficalho (*Flora dos Lusiados*) has referred two of the plants mentioned in Camoens's poem to *Antiaris toxicaria* and *Strychnos Tiéuté.* This would involve a very early knowledge of the Ipo plants.

CCXX.—BOTANY OF GAMBIA DELIMITATION COMMISSION.

By an arrangement, signed at Paris, August 10th, 1889, concerning the delimitation of the English and French Possessions on the West Coast of Africa, the frontier line between Senegambia and the Colony of the Gambia was established.

The Commission for marking out the boundary left England at the end of 1890, and was absent about six months.

The Colonial Office was unable to make any arrangement for attaching a botanist to the expedition, but suggested that Kew might find a medical officer with the necessary qualifications. With the aid of Professor Bayley Balfour, F.R.S., Regius Keeper of the Royal Botanic Garden, Edinburgh, Dr. Brown Lester, a medical graduate of the University, was ultimately selected for the duty.

The Commission kept in the neighbourhood of the River Gambia, and Dr. Brown Lester made a collection fairly representative of its flora as far as the dryness of the season would permit. From a botanical point of view it does not exhibit any very great interest. But the specimens have been determined at Kew, and a list of the determinations, with Dr. Brown Lester's brief notes, is annexed. Taken together they afford a useful picture of the character and productions of the country traversed.

Clematis Thunbergii, *Steud.*—Creeping plant. Bakindic Kotu, north bank. At Bakindic Kotu the ground rises to about 50 feet above sea-level. Kous (African millet) and rice are cultivated in patches around the village. Bush around is dense, with small trees and long grass; patches here and there are seen of primeval forest. Mahogany trees (*Khaya senegalensis*) are plentiful, also trees mentioned at Jinnak. Everything dry and parched except at one or two swamps. A small quantity of ground-nuts are cultivated. Many "locust trees" are to be seen.

Ballé, on Swarakunda Creek, north bank. Soil dry and sandy, flat and swampy near the creek. Seen everywhere. Country at Ballé is

still flat. Lots of palm trees of various kinds. Large mangrove swamps. Mangrove trees very high.

Argemone mexicana, *L.*—Plant 2 to 4 feet high. Grows near moist ground, *e.g.*, village well. An infusion of the leaves is used in coughs. Gungin village, south bank, two miles off the coast. Soil dry and sandy; at places swampy.

All the country about here is flat. There is a great deal of heavy bush, consisting of long grass and small trees, with quantities of small thickly-set palm trees. Between Brikhana and Gungur there is a large forest of bamboo, extending to 10 miles or so. Along the coast are large tall palms with fan-like leaves. There are many palms (? *Raphia vinifera*), yielding the palm-wine. Near the villages are groves of orange trees in a semi-wild state. They bear a very heavy crop of sweet large oranges.

The natives cultivate ground-nuts, kous, calabashes, and cotton to be made into "pagns." A small quantity of rubber is also got. Baobabs (*Adansonia digitata*) plentiful.

Mærua? tree, 50 feet high or so. Balanghar on the great bend of the Gambia River, north bank. Soil dry, sandy, and rocky (volcanic). Country here and there rocky, and hills of volcanic origin. Beside the river are mangrove swamps.

At Balanghar and around there are many swamps, and rice fields of great extent. Small volcanic hills and miles of long grass. Various kinds of palms. Country very dry and parched

No rain while on the north bank, except two hours thunderstorm, which was very local. Country consists of very dense bush with cleared patches near the villages. Very little water to be had except at places mentioned, and at the village wells.

Polygala arenaria, *Willd.*—Bakindic Kotu. Plant 1 to 1½ feet high.

Urena lobata, *L.*—Jinnak, north bank. Soil, dry and sandy. Country flat with swamps. Shrub 4 to 6 feet high Native name, *Bubo-Bubo*. Bark is used for ropes. Seen everywhere.

At Jinnak are many Baobab trees, silver cotton, *Strophanthus* creeper, cowhage (*Mucuna*), palms (yielding palm wine), palms with fan-like leaves, long grass 10 to 14 feet high, and miles of mangrove trees. Also large rice-fields.

Hibiscus cannabinus, *L.*—Jinnak, native name *Wild Saur*. An infusion of the leaves is used by the natives for coughs. Seen everywhere. Bark used for making ropes.—Bakindic Kotu. Plant 2 to 6 feet high.

Hibiscus physaloides, *G. & P.*—Plant 2 to 4 feet high. Collected in a wood, beside a grassy swamp, Ma Kuda, south bank. Soil, dark and moist. Country still flat with dense bush, little cultivation. Large patches of bamboo. Orange trees here and there. No water, except at village well.

Hibiscus, near **H. Grantii**.—Plant 4 to 6 feet high. Leaves, four times as large as specimen. Collected in a wood beside a grassy swamp, Ma Kuda. Soil dark and moist. Weather, warm and dry. Country flat, with large swamps.

Gossypium barbadense, *L.*—Torro, across Sware Kunda Creek, north bank. Soil dry and sandy. At Torro there are many swamps

(mangrove), near the creek. Country same as before. Cotton plant 1 to 3 feet high, seen in all the fields all over the Gambia.

Waltheria americana, *L.*—Jinnak. Shrub 4 to 5 feet high. Seen everywhere.—Dramé Joku, north bank. Soil dry and sandy. Country very flat. Plant 6 feet high. Leaves are used as a poultice for bringing boils to a head. Seen everywhere; also at Ma Kuda, south bank. Plant 2 to 4 feet high. Collected in a wood beside a grassy swamp. Soil dark and moist.

Triumfetta rhomboidea, *Jacq.*

Acridocarpus sp.—Jarrol, Vintang Creek, south bank. Soil dry and sandy. Country flat. Plant springs from dry ground, in half a dozen stems only. Large swamps near the creek. Large mangrove trees on the creek. Large bush fires.—Also seen at Sanding, Vintang Creek, south bank. Soil dry and sandy. Country very flat and dry, except near creek. Many baobabs and patches of bamboos. Kous and cotton cultivated, also ground-nuts.

Icacina senegalensis, *A. Juss.*—N'Jaré, north bank. Soil dry and sandy. Country flat. Plant 1 to 3 feet high. Each branch springs out of the ground, and plant consists of two dozen or so of these shoots. Fruit collected on south bank.—Also at Sanding, Vintang Creek, south bank. Plant 1 to 2½ feet high. About 12 stems spring out of the soil together. Seen everywhere, but only in fruit.

Spondias microcarpa, *Rich.*—Ma Kuda, south bank. Soil dry and swampy in places. Country flat with large swamps. Tree 60 feet high. Large and spreading branches.

Moringa pterygosperma, *Gaertn.*—Never-die-tree. Tree 20 feet high. Always flowering. Government House Garden, Bathurst, Gambia. Soil dry and sandy.

Cnestis ferruginea, *DC.*—Gungur village. Tree 7 feet high. Trunk diameter 1 foot. The only specimen seen.

Crotalaria striata, *DC.*—Jarrol, Vintang Creek. Plant 2 to 3 feet high.

Crotalaria n.sp. near **anthyllopsis**, *Welw.*—Ballé. Creeping plant 10 feet long. Dramé Joku. Creeper, 10 feet long.

Crotalaria n. sp. near **lanceolata**.—Jinnak. Plant 2 to 3 feet high.

Crotalaria cylindrocarpa, *DC.*—Jinnak. Plant 2 to 3 feet high. —Karnghour, north bank. Soil dry and sandy. Country flat. Plant, 2 to 4 feet high. Seen everywhere.

Country around Karnghour is full of long tall grass and many locust trees. No water seen except at village wells. All the country parched.

Indigofera pulchra, *Vahl.*—Balanghar. Plant 2 to 3 feet long.

Indigofera n. sp. near **I. Perottetii**.—Dramé, north bank. Soil dry and sandy. Indigo plant cultivated in little patches about the villages. Country very flat and dry. Bush of grass very dense.

Indigofera hirsuta, *L.*—Dramé. Plant, creeping, 2 to 6 feet long.

Æschynomene near **uniflora**, *F. Mey.*—Jinnak. Plant 3 feet high.

Erythrina senegalensis, *DC.*—Bakindic Kotu. Tree 6 to 8 feet high. Branches few. Pods burst and fruit difficult to collect. Seen everywhere.

Vigna vexillatta, *Benth.*—Collected in a marsh, Kona village, south bank. Soil very dry and sandy. Country very flat. Plant, long trailing tendrils, 3 to 5 feet long.

The country here is very flat and dry. Large tracts are cleared around the villages for kous. Rubber in large quantities can be had. Water very scarce. Could do no work here for over a fortnight owing to the unfriendly state of the natives.

Mezoneuron benthamianum, *Baill.*—Faraba Sotu, south bank. Soil dry and sandy. Country flat. Tree 25 to 40 feet high. Branches and stem covered with thorns. Country still very dry and parched. Bush fires frequent. Nothing but dense bush about. Very little water to be had.

Caesalpinia pulcherrima, *Sw.*—Government House Garden, Bathurst. Tree 4 to 6 feet high.

Cassia Tora, *L.*—Balanghar. Plant 1 to 3 feet long.

Cassia nigricans, *Vahl.*—Karnghour. Plant 2 to 4 feet high. Seen everywhere.

Cassia mimosoides, *L.*—Gungur. Plant 2 to 5 feet high.

Detarium senegalense, *Gmel.*—Jinnak. Tree 30 to 40 feet high. Wide branches. Common name tallow tree. Fruit called "*Dita.*" Seen everywhere in Gambia.

Entada africana, *G. et P.*—Fruit only.

Parinarium macrophyllum, *Sabine.*—Jinnak. Tree 10 to 15 feet high, with wide spreading branches. Native name Tamba-Kunda. Fruit is eaten, seeds are burnt and ashes used as soap, and bark is powdered and smeared over deap seated pains. Seen everywhere.

Drosera indica, *L.*—Collected in a marsh, Kona village. Entire plant with insects adherent. Branches covered with a dewy, clear, sticky exudation. Very common here.

Guiera senegalensis, *Lam.*—Balanghar. Small tree 3 to 8 feet high. Seen on north and south banks of the Gambia.—Stillite, south bank. Country here is very dry and parched. Bush fires numerous. Little cultivation. No water except at village well.

Combretum mucronatum, *Thonn.*—Balanghar. Tree 12 to 15 feet high. Branches spread out like a large shrub. Also at Gungur. Small tree 10 feet high.

Combretum paniculatum, *Vent.* (**C. comosum**, *Don.*).—N'Jaré. Fruit and specimens collected along the south bank. Stillite. Creeping plant 25 to 40 feet long.—Also at Faraba Sotu. Plant, creeper, 40 feet. —Collected at Bakindic Kotu on the north bank. After the plant attains 5 feet or so it starts to creep up the adjacent trees.

Combretum racemosum, *P. de B.*—Bakindic Kotu. Creeping plant up high trees in swampy soil. Leaves near flowers are white with a pink or purple tinge. The young small leaves are used for killing round worms in children.

Osbeckia near **O. senegambieenis**, *G. et P.*—Collected in a wood beside a grassy swamp, Ma Kuda. Soil was dark and moist. Plant 3 feet high.

Nesæa radicans, *G. et P.*—Bakindic Kotu. Plant 2 to 4 feet high.

Jussiæa linifolia, *Vahl.*—Jinnak. Plant 1 to 3 feet high.—Also at Gungur village. Shrub 2 to 4 feet high.

Mukia scabrella, *Arn.*—Dramé. Creeper. Balanghar. Creeping plant 4 to 8 feet long; on the ground and bushes.

Oldenlandia grandiflora, *Hiern.*—Karnghour. Plant 6 inches to 4 feet high. Seen everywhere.—Torro. Plant 2 to 3 feet high. —Dramé Joku. Plant 2 to 5 feet high. Seen everywhere.

Oldenlandia senegalensis, *Hiern.*—Jinnak, Jinnak Creek. Plant. Native name *Temeng-Temeng*. Collected in the long grass. Seen everywhere.—Also at Torro. Plant 5 feet high. Roots made into native broom. Also used as a worm-killer.

Spermacoce globosa, *S. et Thonn.*—Jinnak. Shrub 2 to 3 feet high. Very common.—Gungur village. Weed, seen in all fields, 1 to 2 feet high. Dried leaves are used for healing ulcers. Very common.

Mitracarpum scabrum, *Zucc.*—Karnghour. Plant 6 in. to 1½ feet high. A weed in all the fields. Leaves are dried and placed over old ulcers, which are said to heal rapidly.

Vernonia senegalensis, *Less.*—Balanghar. Tree 10 to 15 feet high. Common name, Bitters tree. Leaves are chewed for their astringent properties. Seen along north and south banks of the Gambia.

Vernonia pauciflora, *Less.*—Bakindic Kotu. Plant 2 to 5 feet high. Seen everywhere.—At Balanghar, a plant 2 to 3 feet high. Seen everywhere in the fields.

At Kona village, south bank of the Gambia, a shrub very bushy, about 7 feet high.

Vernonia cinerea, *Less.*—Bakindic Kotu. Plant 1 to 3 feet high. Seen also at Karnghour, Ballé, and Torro.

Vernonia Perottetii, *Sch. Bip.*—Karnghour. Plant 2 to 6 feet high. Collected in the fields. Very common.—Seen also at Torro. Plant 3 feet high.

Vernonia nigritiana, *O. et H.*—Torro. Plant 6 inches to 18 inches high. Native name *Jubu Jamba*. Roots are pounded and boiled, and taken as a purgative.

Ageratum conyzoides, *L.*—Collected in a wood beside a grassy swamp, Ma Kuda. Plant 2 to 4 feet high.

Vicoa auriculata, *Cass.*—Bakindic Kotu. Plant 1 to 3 feet high. Seen everywhere.

Blumea lacera, *DC.*—Balanghar. Plant 2 to 4 feet high. Seen only here.

Sphæranthus hirtus, *Willd.*—Jinnak. Plant. Native name, *Cum-mu Cum-mu*. Grows in the rice fields during the dry season. A common weed, seen also at Gungur village.

Gynura cernua, *Benth.*—Collected in a marsh, Kona village. Plant 2 to 4 feet high, with long shoots.

Plumbago zeylanica, *L.*—Balanghar. Plant, sort of creeper, 2 to 4 feet long. Branches have a sticky moist feeling.

Strophanthus sarmentosus, *DC.* — N'Jaré. Creeper 40 feet long. Very few trees at present flowering. Kona village.

Baissea multiflora, *A. DC.*—Gungur village. Creeper, rubber, 30 to 60 feet long. Stem, diameter 3 inches. Bark used as a rope.

Calotropis procera, *R. Br.*—Ballé. *Fouftan* tree 3 to 12 feet high. Seen all over the Gambia. All parts of the tree have a milky juice. It is very difficult to preserve against insects and mildew. It is said to be a good thing for sprains, headaches, and other pains. The leaves are applied warm to the affected part.

Usteria guineensis, *Willd.*

Enicostema littorale, *Blume.*—Bakindic Kotu. Plant 1 to 2 feet high. Soil swampy.

Schultesia senegalensis, *Baker.*—Entire plant, collected in a marsh, Kona village.

Heliotropium indicum, *L.*—Gungur village. Shrub 2 to 4 feet high. Native name *Cock's Comb.* An infusion is used in Gonorrhœa.

Ipomœa Bona-nox, *L.* — Government House Garden, Bathurst. St. Helena moon flower. Creeper 20 to 30 feet long.

Ipomœa involucrata, *P. de B.*—Collected in a wood beside a grassy swamp. Ma Kuda. Soil dark and moist. 7 to 10 feet long. Light purple flower.

Ipomœa pinnata, *Hochst.* — Balanghar. Creeping plant 6 feet long.

Ipomœa Lesteri, *Baker*, n. sp.—Gungur village. A convolvulus 30 feet long or so.

Hewittia bicolor, *W. & A.*—Ma Kuda. 4 to 8 feet long. Flower delicate cream colour.

Solanum near Melongena, *L.*—Gungur village. Shrub 3 to 4 feet high.

Physalis angulata, *L.*—Jinnak. Shrub 2½ to 6 feet high. Native name *Cubum Pap.* Used as an external counter-irritant.

Scoparia dulcis, *L.*—Gungur village. Plant 4 feet high. Common name *Broom.*—Jarrol, Vintang Creek. Plant 2 to 3 feet high.

Alectra senegalensis, *Benth.*—Jinnak. Small plant. Seen in dry rice fields everywhere. Yellow flower. In a wood beside a grassy swamp.—Ma Kuda. Plant 1 foot high.

Buchnera, n. sp.—Faraba Sotu. Plant 3 to 6 feet high. Grows amongst the high bush grass. Seen everywhere.

Buchnera leptostachya, *Benth.*

Buchnera dura, *Benth.*—Karnghour. Plant 1 to 2½ feet high.—Dramé Joku. Plant 2 to 3 feet high. Native name *Dam-Pan.* Used as a blue-black dye.

Newbouldia lævis, *Seem.*—Stillite. Tree 4 to 8 feet high. Flowers grow on upright stem. Stem has no leaves on it for 2 or 3 feet.—Jarrol, Vintang Creek. Tree 4 to 10 feet.

Kigelia africana, *Benth.*—Ka fundi, 30 miles south of Gungur, along the coast, south bank. Soil dry sand. Country flat. Tree 30 to 40 feet high. Large, long fruit collected.

The country here is very dense bush except at clearings around the villages. At places on the coast are very extensive rice fields. Many palm-wine palms (*Raphia*) are here, also large patches of bamboos. Orange groves numerous. Country parched. Bush fires starting.

Nelsonia campestris, *R. Br.*—Dramé. Creeping plant.

Hygrophila senegalensis, *Anders.*—Jinnak. Plant 2 to 3 feet high, collected in the dry rice fields.

Hygrophila spinosa, *Anders.*—Jinnak. Plant 2 to 4 feet high. In moist ground.

Phaylopsis parviflora, *Willd.*—Jinnak. Shrub 3 feet high. Common name *Pap-leaf*. The leaves are used as a hot fomentation over the spleen in ague-cake. When the shrub is placed in water the seeds burst with a slight crackling sound. Seen everywhere.

Schwabea ciliaris, *Nees.*—Ballé. Plant 3 feet high.

Lantana Camara, *L.*—Government House Garden, Bathurst. Shrub 2 to 6 feet high.

Lippia adoensis, *Hochst.*—Stillite. Plant 2 to 3 feet high.

Ocimum basilicum, *L.*—Dramé. Shrub 2 to 4 feet high. Native name *Patmagi*. An infusion made of the leaves is used in fevers. Leaves are also used in soups.—Also at Dramé Joku. Shrub 2 to 4 feet high.

Leucas martinicensis, *R. Br.*—Karnghour. Plant 1 to 2 feet high. Common name Wild tea-bush. The whole plant is made into an infusion and used as a wash in fevers.

Celosia laxa, *Schum. et Thonn.*—Collected in a wood near a marsh in swampy soil, Ma Kuda. Plant with long trailing branches amongst bushes.

Celosia trigyna, *L.*—Bakindic Kotu. Plant 2 to 3 feet high. Seen everywhere.

Loranthus leptolobus, *Benth.* — Gambian mistletoe. Balanghar. Plant 2 feet high. Grows as a parasite on *Mærua*.—Also at Bathurst Garden. Grows in clumps on guava trees.

Jatropha multifida, *L.*—Bathurst Garden. Tree 10 to 12 feet high.

Ricinus communis, *L.*—Balanghar. Castor-oil tree. Seen everywhere near villages.

Gloriosa superba, *L.*—Collected in a wood beside a grassy swamp, Ma Kuda. Soil dark and moist. Stem single creeping along ground 8 feet long. Only specimen seen.

Commelyna nudiflora, *L.*, var. **Werneana**, *Hassk.* Jinnak. A creeping plant on ground and shrubs. Near water. Common name High-grass. Seen everywhere.

Pistia Stratiotes, *L.* — N'Jaré. Aquatic plant growing on the surface of water in large clumps. Native name Eye-pity. Used by the natives as an anodyne eye-wash. Leaves are soaked in cold water. If the plant comes in contact with the body it produces a sharp stinging sensation very like a nettle sting, and the pain continues for some minutes.

At N'Jaré there is a stream of fresh water about 50 yards wide in which this aquatic plant was collected. Nothing else was seen here; stream full of long dried up grass. Much the same trees seen here as before. In the fields small cotton plants cultivated.

Lycopodium cernuum, *L.*—Jarrol, Vintang Creek. In moist soil.

Azolla pinnata, *R. Br.*

Hexagonia polygramma, *Mont.*

Polystictus funalis, *Fries.*

CCXXI.—MISCELLANEOUS NOTES.

The Secretary of State for India in Council has selected, upon the nomination of Kew, Mr. John Horne Stephen, to be head gardener at the Lal Bagh Gardens, Bengalore, under the Durbar of Mysore.

Dr. Stapf's valuable Persian herbarium has been acquired for the Royal Gardens by purchase. It contains about 1,100 species, and will largely augment the collections from that region, which was but poorly represented at Kew, if we except Dr. Aitchison's collection from the extreme east of Persia.

From the Botanical Division of the United States Agricultural Department, Washington, there has been received a very fine set of Mexican plants, collected by Dr. Edward Palmer, and described and published by various American botanists. The Mexican flora seems indeed almost inexhaustible; every fresh collection abounding in new species.

Mr. F. M. Bailey, F.L.S., the active Colonial botanist of the Colony of Queensland, and one of the recent explorers of the Bellenden-Ker range, has sent specimens to Kew of about fifty of his proposed new species.

From Dr. Engler, the Director of the Berlin Botanic Garden, Kew has received a parcel of novelties, chiefly from the collections made by German travellers in tropical Africa.

In connexion with the botanical collections made by Mr. Antwerp E. Pratt, in Western China and Eastern Thibet, at elevations of 9,000 to 13,500 feet, the Principal Assistant in the Herbarium, Mr. Hemsley, F.R.S., has visited Paris, in order to study the novelties collected by Prince Henry of Orleans, and published by Professor Bureau and Mr. Franchet. A considerable number of Mr. Pratt's plants proved to be the same, yet the number of different species was even larger. These will be published as soon as possible.

Two collections of dried Bornean plants have been received from Dr. Haviland, Curator of the Museum at Sarawak, each of about 400 species. The first has been partly worked out by Dr. Stapf the Assistant for India, and has proved rich in novelties, especially in *Melastomaceæ*, of which there are two or three new genera, and at least a score of new species. Among the latter are two species of the singular polyandrous genus *Plethiandra*, Hook. f., previously only known from a very imperfect specimen collected by Motley. There is also a new genus of the *Araliaceæ*, with a calyptrate calyx, and half a dozen Begonias.

Dr. Glaziou has presented a further instalment of his enormous Brazilian herbarium, containing about 700 species.

A small collection of plants made by Mr. Graham Kerr on Captain Page's disastrous expedition up the Rio Pilcomayo (a river rising in Bolivia and separating northern Argentina and Paraguay) proves interesting, though only numbering about 270 specimens. *Prosopis ruscifolia*, Griseb., is a very remarkable plant, having most formidable woody spines 7 or 8 inches long; and there are many undescribed plants in this collection.

The Keeper of the Herbarium, Mr. Baker, has lately proceeded to the Riviera to examine the fine collections of *Yucca*, *Aloe*, *Agave*, *Dasylirion*, &c. growing in the gardens of Mr. Thomas Hanbury, F.L.S., at La Mortola, near Mentone, and others. Mr. Baker has long made a special study of this class of plants, and his visit has proved very instructive. A detailed report of the results will appear in a future number of the *Bulletin*.

An interesting series of apparatus and implements connected with the Gambier industry (*Uncaria Gambier*, Roxb.) of the Straits Settlements has been received from Mr. H. N. Ridley, F.L.S., Director of the Gardens and Forest Department, Singapore. It includes a model of a Gambier factory, with the following implements used in the cultivation and manufacture of Gambier (see *Kew Bulletin*, 1889, pp. 247–253) :—

A knife for cutting the Gambier plant in the field. A chopper for chopping up leaves and twigs before putting them into the boiler. A fork made of the hard wood of the "Tampenis" (*Sloetia sideroxylon*) used for stirring the Gambier leaves in the boiling pan. A basket for

bringing the fresh cut leaves to the factory. A rubbish basket for taking away the exhausted leaves, which are thus carried to the pepper plantations or Gambier fields for manure. A tub for holding liquid Gambier; in this tub the Gambier is set. Stick of "Mahang" wood (*Macaranga hypoleuca*) used in setting the liquid. A coarse strainer used for taking the spent leaves out of the boiler. A cocoanut-shell strainer fixed to a kind of sieve by the handle so that it hangs down in the boiling Gambier. When the larger *débris* has been taken out by the coarse strainer, the smaller bits drop into the cocoanut shell and are then removed.

The collection of vanilla pods in the Museum of Economic Botany (No. ii.), has recently been revised and augmented by a series illustrating the principal kinds now known in English trade, including the following sorts:—Madagascar, Bourbon, Réunion, Mauritius, Seychelles, Bahia, Mexico, Java, and "vanillons" (the less valuable sorts of vanilla).

A large supply of the "butter nut" of British Guiana (*Caryocar nuciferum*) was received from Mr. G. S. Jenman, F.L.S., Superintendent of the Botanical Gardens, Georgetown, Demerara. The tree yielding these nuts is a very valuable timber tree as well as a fruit-yielding tree, and its successful introduction to the tropical parts of the Old World, has been a matter of solicitude on the part of Kew for some years. An attempt made in 1888 apparently failed. The present supply of nuts has been distributed to the botanical establishments at Calcutta, Madras, Queensland, Lagos, Ceylon, Mauritius, Singapore, Natal, while some were sown at Kew.

A very fine, and probably a unique, plant of *Yucca filifera* was presented to the Royal Gardens by Mons. de Falbe, Villa Valetta, Cannes, and placed in the Temperate House. This specimen is 25 feet high, and about 3 feet in diameter at the base. It is a magnificent plant in size and character, and although it has lost its terminal crown of leaves, owing to injury during transit, it is hoped that it will eventually recover. The species is figured in the *Botanical Magazine*, tab. 7197, from a specimen received at Kew in 1888. When it arrived it was apparently dead, and the trunk was placed in the Museum of Economic Botany (No. iii). After remaining there for two years in a dormant condition it put out rudimentary leaves, and it ultimately flowered. The plant was then removed to the Temperate House, where its inflorescence was fully developed in September 1890.

The subject of Ramie has once more been brought forward in France, and a trial of methods and appliances for decorticating and preparing Ramie was held at Paris under the auspicies of *The Société des Agriculteurs de France* on the 25th to the 30th September last. It will be recollected by those who take an interest in this subject that previous trials were held at Paris in 1888 and 1889, and owing to the importance of Ramie as a possible industrial plant for India the Secretary of State for India in Council sanctioned an arrangement whereby the Assistant

Director of Kew was enabled to attend the trials and prepare reports embodying the results for the information of the India Office. A summary of these reports was afterwards published in the *Kew Bulletin* for November and December 1888, and November and December 1889. At the trials in September last the Director of Kew was able to be present as representative for India, and the results, which have just been worked out, will, by permission of the Secretary of State for India in Council, be shortly published in the *Kew Bulletin*. The trials took place this year at Gennevilliers, a suburb of Paris, in a field where Ramie (the white-leaved sort) had been grown specially for the purpose. After the trial of the decorticators had been completed the ribbons were afterwards passed on to be treated by the chemical processes so as to test exactly the amount of filasse (or marketable fibre ready for spinning) produced by each system. The chemical processes have necessarily occupied some time, but as the report by the jury and the awards have been officially made known there will be sufficient evidence forthcoming to enable a tolerably clear estimate being formed of the advance which has been made towards solving the difficulties hitherto connected with the Ramie question.